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(54) Title: A METHOD FOR PRODUCING A SOLUTION HAVING LUBRICATING PROPERTIES INTENDED TO BE USED AS AN ADDITIVE TO A LIQUID

(57) Abstract: The present invention refers to a method for producing a solution having lubrication properties intended to be used preferably as an additive as a concentrate blended to a liquid, such as a liquid fuel. A boric compound such as boric acid and/or boric oxide is dissolved in a solvent and the borate ions are in a homogeneous phase together with the solvent, which as a solution in stable conditions is made to have a high concentration of borate thanks to the hydrogen bonds counter action to the electro negativity of the boric compound and its tendency to covalent bonding, the solution being used as and additive to the actual liquid, which in this way receive friction reducing, lubricating and corrosion inhibiting characteristics.

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A method for producing a solution having lubricating properties intended to be used as an additive to a liquid

The present invention refers to a method for producing a  
5 solution having lubrication properties intended to be used  
as an additive to a liquid preferably a liquid fuel or a  
lubricant and a solution made according to said method,  
which when blended gives the liquid friction-reducing,  
lubricating and corrosion inhibiting characteristics.

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It is previously known, as example from US 5,431,830, that  
boron can establish a complex ligand bond to other metals.  
This occurs after an exposure over time, from hours to  
days. The boron compounds in question are aligned to two  
15 dimensional pallets, that slides on each other, which  
causes a reduced friction. Furthermore, boron acts as a  
corrosion inhibitor for metals as the boric acid bonds to a  
thin layer on the underlying metal surface and prevents  
oxidation due to the electro negativity, which makes boron  
20 an effective reduction substance that prevents corrosion  
of exposed surfaces.

According to previously known technique, oil is blended  
with a high concentration of boric acid, and the blend is  
25 diluted at a ratio of approximately 10% to different  
lubricating oils.

According to US 6,368,369, it's stated that boric acid can  
be used as an additive to fuels to accomplish a friction  
30 reducing effect. The method is to mix boric acid in a base  
oil or a concentrate based on a diesel fuel. The particle  
size of the boric compound, normally in the range of 0.5  
to 20 micron, is made by "jet-milling", a method in doing  
so. Experiments have shown that an additive, diesel addi-

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tive as example, made by this method over time has a limited stability. The boric acid particles are aggregating and are falling out and gathered on the bottom of the container. This happens within a period of months or less. This could lead to severe consequences for any engine, as example a diesel engine. Even when the boric acid particles are mixed in a base oil and thereafter eventually are diluted in fuel or the like, the same risk exists.

The object of the present invention is to eliminate the disadvantages as mentioned above, and to make an additive to a fluid or liquid, preferably a liquid fuel or a lubricant, which can be dissolved in the liquid and give the liquid friction reducing, lubricating and corrosion restraining effect. The characterizing features of the invention are stated in the following claims.

Thanks to the invention, a method for producing a solution having lubricating properties of the kind mentioned above, which in a distinguishing way fulfils its purpose and also an application of the mentioned solution as an additive to a liquid, such as fluid fuel or a lubricant to give the liquid friction reducing, lubricating and corrosion restraining characteristics. The invention means that a boric compound with lubricating characteristics exists in the form of a solution. The borat ions will at that consist of a homogenous phase together with the solvent, and which solution, under stable conditions at that may consist of a high concentration of borate, thanks to the used solvent, and preferably an alcohols hydrogen bonds, counteracts the elctro negativity of the boric compound and it's tendency to covalent bonds.

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The invention is described further below by aid of some preferable embodiment examples.

- 5 The boric compounds, which according to an example, are dissolved according to the foregoing invention are preferably Boric  $\text{BOH}_3$  or dibortrioxide  $\text{B}_2\text{O}_3$  (boric oxide), which offers good friction reducing characteristics. The solvent can consist of water and/or an alcohol,  
10 individually or blended to a mixture. The solvent should also be a liquid hydrogen. The most alcohols should be used, as example ethanol, methanol etc. and the solution is made by shaking boric acid or bortrioxide together with alcohol or water, eventually also by adding small  
15 mechanical elements to further increase the mechanical work.

In the solution, the boric compound may be in a concentration of up to 250,000 ppm or more if necessary. When  
20 blended to fuel such as diesel or gasoline, the fuel mixture should consist of a concentration of boric compound in the range of 10 to 1,000 ppm, preferably in the range of 100 to 200 ppm.

- 25 When the solution is added to a lubricant, the composition consisting lubricant and the solution should have a concentration of boric compounds of around 400 ppm/4%.

In another application, the solution is used as an  
30 additive, which is added in a proportion to a lubricant, hydro carbon fuel or a bio fuel such as the boric compound is bonded on surfaces exposed by friction at which the friction is reduced. The solution allows for an optimal dissolvment in the fluid and thereby the mentioned advan-

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tages of a stable solution which is friction reducing, lubricating and corrosion inhibiting. The fluid may be as example hydro carbon fuels such as diesel or gasoline or  
5 other and the solution may also be injected separately in an combustion machine such as an hydrogen engine or other engine where friction reduction and corrosion inhibiting is needed. When mixing a boric acid solution with hydrogen, a thermic reaction is achieved, which further  
10 increases the tendency to covalent bond.

The invention also incorporates a solution as such made as an additive by dissolving a boric compound, a boric acid and/or bortrioxide.

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### Claims

1. A method for producing a solution having lubrication properties intended to be used preferably as an additive as a concentrate blended to a liquid, such as a liquid fuel, characterized in that a boric compound such as boric acid and/or bortrioxide is dissolved in a solvent and the borate ions are in a homogene phase together with the solvent, which as a solution in stable conditions is made to have a high concentration of borate thanks to the hydrogen bonds counter action to the electro negativity of the boric compound and its tendency to covalent bonding, the solution being used as and additive to the actual liquid, which in this way receive friction reducing, lubricating and corrosion inhibiting characteristics.

2. A method according to claim 1, characterized in that the solvent is an alcohol and/or water or liquid hydrogen and the mixture is shaken to dissolve the boric compounds at the same time as the dissolving time is accelerated by using heat.

3. A method according to claim 1, characterized in that the mixture is shaken, with or without mechanical elements added to further accelerate the dissolving of the boric compound in the solution by warming up or with aid of a combination thereof.

4. A method according to claim 1, characterized in that the addition of the boric compound in the solution makes a solution with a borate concentration exceeding 250,000 ppm or more.

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5. The use of a solution made according to claim 1 as an additive to a fuel in a blending, depending to the type of fuel, gives a concentration of boric compound in the range of 10 to 1,000 ppm.

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6. A solution made as an additive according to any of the preceding claims by dissolving a boric compound, boric acid and/or bortrioxide.

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 03/01366

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: C10M 125/26

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: C10M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, CHEM.ABS.DATA

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4557844 A (ANDREW G. HORODYSKY), 10 December 1985 (10.12.85), column 1, line 9 - line 14; column 2, line 11 - line 16; column 2, line 34 - column 3, line 20, column 4, line 13 - line 17 --	1-6
X	US 4524004 A (ANDREW G. HORODYSKY), 18 June 1985 (18.06.85), column 1, line 9 - line 29 --	1-6
A	US 4440656 A (ANDREW G. HORODYSKY), 3 April 1984 (03.04.84), column 2, line 17 - line 35 --	1-6

☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

\* Special categories of cited documents:

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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International application No.

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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4741848 A (FREDERICK W. KOCH ET AL), 3 May 1988 (03.05.88), column 2, line 2 - line 43  -----	1-6

## INTERNATIONAL SEARCH REPORT

Information on patent family members

31/10/03

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US	4440656	A	03/04/84	NONE	
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